

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of

Stefan SCHUERG et al

Based on PCT/DE 01/02039

For: VALVE FOR CONTROLLING FLUIDS

PRELIMINARY AMENDMENT

Commissioner for Patents
Washington, DC 20231

Sir:

Prior to examination, please amend the above-identified application as follows:

IN THE SPECIFICATION

Page 1, between the title and paragraph [0001] insert the following:

[0000.2] CROSS-REFERENCE TO RELATED APPLICATIONS

[0000.4] This is a 35 U.S.C. 371 application of PCT/DE 01/02039, filed on May 30, 2001.

[0000.6] BACKGROUND OF THE INVENTION

replace paragraph [0001] with the following amended paragraph:

[0001] Field Of The Invention

replace paragraph [0002] with the following amended paragraph:

[0002] The present invention relates to a valve for controlling fluids and more particularly to such a valve including a piezoelectric actuator disposed in an actuator bore.

between paragraphs [0002] and [0003] insert the following:

[0002.5] Brief Description Of The Prior Art

Page 2, replace paragraph [0005] with the following amended paragraph:

[0005] SUMMARY OF THE INVENTION

replace paragraph [0006] with the following amended paragraph:

[0006] The valve for controlling fluids according to the invention has the advantage over the prior art that it no longer requires an O-ring for sealing purposes. Sealing off the actuator module from the hydraulic booster is achieved such that a bellows is solidly connected to the actuator and to the actuator bore. As a result of this feature of the invention, both the O-ring and the disk in which the groove for the O-ring is provided can be dispensed with. This reduces the number of component parts, and the valve of the invention can be produced more simply and economically. With the elimination of the disk, still more installation space is gained, or in other words the valve of the invention can be constructed more compactly. Especially if the valve is used as an injection valve for an engine, this is a major advantage, since the space available in the engine compartment is limited, and hence the valve can be installed in different engines from the most various manufacturers without requiring modifications.

Page 3, replace paragraph [0013] with the following amended paragraph:

[0013] **BRIEF DESCRIPTION OF THE DRAWINGS**

replace paragraph [0014] with the following amended paragraph:

[0014] One exemplary embodiment of the present invention is described in detail herein below, in conjunction with the drawings, in which:

Page 4, replace paragraph [0015] with the following amended paragraph:

[0015] Fig. 1 is a longitudinal sectional view of a valve for controlling fluids in accordance with one exemplary embodiment of the present invention; and

replace paragraph [0016] with the following amended paragraph:

[0016] Fig. 2 is a view similar to Fig. 1 showing a valve for controlling fluids in accordance with the prior art.

replace paragraph [0017] with the following amended paragraph:

[0017] **DESCRIPTION OF THE PREFERRED EMBODIMENTS**

Page 7, line 1, delete “Claims” and insert --“We Claim”--.

IN THE CLAIMS

Please cancel claims 1-8 and add new claims 9-23.

9. In a valve for controlling fluids, having a piezoelectric actuator (2) which is disposed in an actuator bore (3), a hydraulic booster (11), and a bellows (5) for absorbing an axial stroke of the piezoelectric actuator (2), the improvement wherein the bellows (5) is solidly connected to the piezoelectric actuator (2) and to the actuator bore (3).
10. The valve for controlling fluids of claim 9, wherein the bellows (5) has a sleevelike extension (7), which is solidly connected to the actuator bore (3).
11. The valve for controlling fluids of claim 9, wherein the connection between the bellows (5) and the piezoelectric actuator (2) and/or the connection between the bellows (5) and the actuator bore (3) is embodied as a welded connection.
12. The valve for controlling fluids of claim 10, wherein the connection between the bellows (5) and the piezoelectric actuator (2) and/or the connection between the bellows (5) and the actuator bore (3) is embodied as a welded connection.
13. The valve for controlling fluids of claim 9, wherein the sleevelike extension (7) of the bellows (5) is solidly connected to the actuator bore (3) via a press fit of a retaining body (10).

14. The valve for controlling fluids of claim 10, wherein the sleeve-like extension (7) of the bellows (5) is solidly connected to the actuator bore (3) via a press fit of a retaining body (10).

15. The valve for controlling fluids of claim 13, wherein the retaining body (10) at least partly receives the hydraulic booster (11).

16. The valve for controlling fluids of claim 14, wherein the retaining body (10) at least partly receives the hydraulic booster (11).

17. The valve for controlling fluids of claim 9, wherein the bellows (5) is embodied with three undulations (6).

18. The valve for controlling fluids of claim 9, wherein the bellows (5) is produced from metal.

19. The valve for controlling fluids of claim 10, wherein the bellows (5) is produced from metal.

20. The valve for controlling fluids of claim 11, wherein the bellows (5) is produced from metal.

21. The valve for controlling fluids of claim 9, wherein an actuator spring (16) has at least four windings, which are placed against the actuator bore (3).

22. The valve for controlling fluids of claim 10, wherein an actuator spring (16) has at least four windings, which are placed against the actuator bore (3).

23. The valve for controlling fluids of claim 11, wherein an actuator spring (16) has at least four windings, which are placed against the actuator bore (3).

SEARCHED

IN THE ABSTRACT

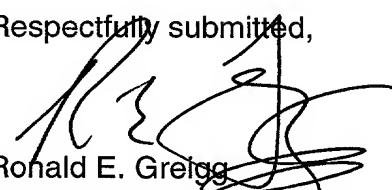
Please substitute the attached Abstract of the Disclosure with the abstract as originally filed.

REMARKS

The above amendments are being made to place the application in better condition for examination.

Entry of the amendment is respectfully solicited.

Respectfully submitted,



Ronald E. Greigg
Attorney for Applicants
Registration No. 31,517
Customer No. 002119

Greigg & Greigg, P.L.L.C.
1423 Powhatan Street
Unit One
Alexandria, VA 22314

Telephone: (703) 838-5500
Facsimile: (703) 838-5554

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ABSTRACT OF THE DISCLOSURE

The present invention relates to a valve for controlling fluids, which has a piezoelectric actuator that is disposed in an actuator bore. A hydraulic booster and a bellows are also provided. The bellows is embodied such that it can absorb the axial stroke of the piezoelectric actuator. The bellows is connected solidly to the piezoelectric actuator and is also connected solidly to the actuator bore to assure a fluid-tight seal of the actuator module relative to the other regions of the valve.

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE SPECIFICATION

Page 1, between the title and paragraph [0001]:

[0000.2] CROSS-REFERENCE TO RELATED APPLICATIONS

[0000.4] This is a 35 U.S.C. 371 application of PCT/DE 01/02039, filed on May 30, 2001.

[0000.6] BACKGROUND OF THE INVENTION

paragraph [0001]:

[0001] [Prior Art] Field Of The Invention

paragraph [0002]:

[0002] The present invention relates to a valve for controlling fluids [as generically defined by the preamble to claim 1] and more particularly to such a valve including a piezoelectric actuator disposed in an actuator bore.

between paragraphs [0002] and [0003]:

[0002.5] Brief Description Of The Prior Art

Page 2, paragraph [0005]:

[0005] [Advantages of the Invention] SUMMARY OF THE INVENTION

paragraph [0006]:

[0006] The valve for controlling fluids according to the invention [,having the characteristics of claim 1,] has the advantage over the prior art that it no longer requires an O- ring for sealing purposes. Sealing off the actuator module from the hydraulic

booster is achieved such that a bellows is solidly connected to the actuator and to the actuator bore. As a result of this feature of the invention, both the O-ring and the disk in which the groove for the O-ring is provided can be dispensed with. This reduces the number of component parts, and the valve of the invention can be produced more simply and economically. With the elimination of the disk, still more installation space is gained, or in other words the valve of the invention can be constructed more compactly. Especially if the valve is used as an injection valve for an engine, this is a major advantage, since the space available in the engine compartment is limited, and hence the valve can be installed in different engines from the most various manufacturers without requiring modifications.

Page 3, paragraph [0013]:

[0013] [Drawing] BRIEF DESCRIPTION OF THE DRAWINGS

paragraph [0014]:

[0014] One exemplary embodiment of the present invention is [shown in the drawing and explained in further detail in the ensuing description. Shown are:] described in detail herein below, in conjunction with the drawings, in which:

Page 4, paragraph [0015]:

[0015] Fig. 1[,] is a longitudinal sectional view of a valve for controlling fluids in accordance with one exemplary embodiment of the present invention; and

paragraph [0016]:

[0016] Fig. 2[,] is a view similar to Fig. 1 showing a valve for controlling fluids in accordance with the prior art.

paragraph [0017]:

[0017] [Description of the Exemplary Embodiment] DESCRIPTION OF THE PREFERRED EMBODIMENTS

[Abstract] **ABSTRACT OF THE DISCLOSURE**

The present invention relates to a valve for controlling fluids, which has a piezoelectric actuator [(2)] that is disposed in an actuator bore [(3)]. A hydraulic booster [(11)] and a bellows [(5)] are also provided. The bellows [(5)] is embodied such that it can absorb the axial stroke of the piezoelectric actuator [(2)]. The bellows [(5)] is connected solidly to the piezoelectric actuator [(2)] and is also connected solidly to the actuator bore to [(3)]. This assures] assure a fluid-tight seal of the actuator module relative to the other regions of the valve.

[(Fig. 1)]